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L22	405367	hardware	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/05/10 12:24
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L24	229138	L21 and L22	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/05/10 12:24
L25	4526	TLB	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/05/10 12:24
L26	57	L24 and L23	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/05/10 12:24
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1 Trace-driven memory simulation: a survey   ■
Richard A. Uhlig, Trevor N. Mudge
June 1997 **ACM Computing Surveys (CSUR)**, Volume 29 Issue 2

Full text available: 📄 pdf(636.11 KB)   Additional Information: full citation, abstract, references, citings, index terms, review

As the gap between processor and memory speeds continues to widen, methods for evaluating memory system designs before they are implemented in hardware are becoming increasingly important. One such method, trace-driven memory simulation, has been the subject of intense interest among researchers and has, as a result, enjoyed rapid development and substantial improvements during the past decade. This article surveys and analyzes these developments by establishing criteria for evaluating trac ...

Keywords: TLBs, caches, memory management, memory simulation, trace-driven simulation

2 Implementation aspects of a SPARC V9 complete machine simulator   ■
Bill Clarke, Adam Czezowski, Peter Strazdins
January 2002 **Australian Computer Science Communications , Proceedings of the twenty-fifth Australasian conference on Computer science - Volume 4**, Volume 24 Issue 1

Full text available: 📄 pdf(1.33 MB)   Additional Information: full citation, abstract, references, index terms

In this paper we present work in progress in the development of a complete machine simulator for the UltraSPARC, an implementation of the SPARC V9 architecture. The complexity of the UltraSPARC ISA presents many challenges in developing a reliable and yet reasonably efficient implementation of such a simulator. Our implementation includes a heavily object-oriented design for the simulator modules and infrastructure, caching of repeated computations for performance, adding an OS (system call) emu ...

Keywords: SMP, SPARC V9 ISA, UltraSPARC, complete machine simulator, execution-driven simulation, object-oriented design

3   ■
Virtual machine monitors: Xen and the art of virtualization
Paul Barham, Boris Dragovic, Keir Fraser, Steven Hand, Tim Harris, Alex Ho, Rolf Neugebauer,

Ian Pratt, Andrew Warfield
October 2003 **Proceedings of the nineteenth ACM symposium on Operating systems principles**

Full text available: pdf(168.76 KB)   Additional Information: full citation, abstract, references, citings, index terms

Numerous systems have been designed which use virtualization to subdivide the ample resources of a modern computer. Some require specialized hardware, or cannot support commodity operating systems. Some target 100% binary compatibility at the expense of performance. Others sacrifice security or functionality for speed. Few offer resource isolation or performance guarantees; most provide only best-effort provisioning, risking denial of service.This paper presents Xen, an x86 virtual machine monit ...

Keywords: hypervisors, paravirtualization, virtual machine monitors

4 **Disco: running commodity operating systems on scalable multiprocessors**
Edouard Bugnion, Scott Devine, Kinshuk Govil, Mendel Rosenblum
November 1997 **ACM Transactions on Computer Systems (TOCS)**, Volume 15 Issue 4

Full text available: pdf(400.76 KB)   Additional Information: full citation, abstract, references, citings, index terms, review

In this article we examine the problem of extending modern operating systems to run efficiently on large-scale shared-memory multiprocessors without a large implementation effort. Our approach brings back an idea popular in the 1970s: virtual machine monitors. We use virtual machines to run multiple commodity operating systems on a scalable multiprocessor. This solution addresses many of the challenges facing the system software for these machines. We demonstrate our approach with a prototy ...

Keywords: scalable multiprocessors, virtual machines

5 **Disco: running commodity operating systems on scalable multiprocessors**
Edouard Bugnion, Scott Devine, Mendel Rosenblum
October 1997 **ACM SIGOPS Operating Systems Review , Proceedings of the sixteenth ACM symposium on Operating systems principles**, Volume 31 Issue 5
Full text available: pdf(2.30 MB)   Additional Information: full citation, references, citings, index terms

6 **Shade: a fast instruction-set simulator for execution profiling**
Bob Cmelik, David Keppel
May 1994 **ACM SIGMETRICS Performance Evaluation Review , Proceedings of the 1994 ACM SIGMETRICS conference on Measurement and modeling of computer systems**, Volume 22 Issue 1

Full text available: pdf(1.28 MB)   Additional Information: full citation, abstract, references, citings, index terms

Tracing tools are used widely to help analyze, design, and tune both hardware and software systems. This paper describes a tool called Shade which combines efficient instruction-set simulation with a flexible, extensible trace generation capability. Efficiency is achieved by dynamically compiling and caching code to simulate and trace the application program. The user may control the extent of tracing in a variety of ways; arbitrarily detailed application state information may be collected ...

7 **Compilation and run-time systems: DELI: a new run-time control point**
Giuseppe Desoli, Nikolay Mateev, Evelyn Duesterwald, Paolo Faraboschi, Joseph A. Fisher

November 2002 **Proceedings of the 35th annual ACM/IEEE international symposium on Microarchitecture**

Full text available: pdf(1.27 MB) Publisher Site   Additional Information: full citation, abstract, references, citings, index terms

The Dynamic Execution Layer Interface (DELI) offers the following unique capability: it provides fine-grain control over the execution of programs, by allowing its clients to observe and optionally manipulate every single instruction---at run time---just before it runs. DELI accomplishes this by opening up an interface to the layer between the execution of software and hardware. To avoid the slowdown, DELI caches a private copy of the executed code and always runs out of its own private cache.In ...

8 Binary translation and architecture convergence issues for IBM system/390

Michael Gschwind, Kemal Ebcioğlu, Erik Altman, Sumedh Sathaye

May 2000 **Proceedings of the 14th international conference on Supercomputing**

Full text available: pdf(1.44 MB)   Additional Information: full citation, abstract, references, index terms

We describe the design issues in an implementation of the ESA/390 architecture based on binary translation to a very long instruction word (VLIW) processor. During binary translation, complex ESA/390 instructions are decomposed into instruction "primitives" which are then scheduled onto a wide-issue machine. The aim is to achieve high instruction level parallelism due to the increased scheduling and optimization opportunities which can be exploited by binary translation software ...

9 Virtual machines: Scale and performance in the Denali isolation kernel

Andrew Whitaker, Marianne Shaw, Steven D. Gribble

December 2002 **ACM SIGOPS Operating Systems Review**, Volume 36 Issue SI

Full text available: pdf(1.91 MB)   Additional Information: full citation, abstract, references, citings

This paper describes the Denali isolation kernel, an operating system architecture that safely multiplexes a large number of untrusted Internet services on shared hardware. Denali's goal is to allow new Internet services to be "pushed" into third party infrastructure, relieving Internet service authors from the burden of acquiring and maintaining physical infrastructure. Our isolation kernel exposes a virtual machine abstraction, but unlike conventional virtual machine monitors, Denali does not ...

10 Soft timers: efficient microsecond software timer support for network processing

Mohit Aron, Peter Druschel

August 2000 **ACM Transactions on Computer Systems (TOCS)**, Volume 18 Issue 3

Full text available: pdf(272.44 KB)   Additional Information: full citation, abstract, references, citings, index terms, review

This paper proposes and evaluates soft timers, a new operating system facility that allows the efficient scheduling of software events at agranularity down to tens of microseconds. Soft timers can be used to avoid interrupts and reduce context switches associated with network processing, without sacrificing low communication delays. More specifically, soft timers enable transport protocols like TCP to efficiently perform rate-based clocking of packet transmissions. Experiments indicate that ...

Keywords: polling, timers, transmission scheduling

11 Multigrain shared memory

Donald Yeung, John Kubiatowicz, Anant Agarwal

May 2000 **ACM Transactions on Computer Systems (TOCS)**, Volume 18 Issue 2

Additional Information:

Full text available: pdf(369.18 KB)   full citation, abstract, references, index terms, review

Parallel workstations, each comprising tens of processors based on shared memory, promise cost-effective scalable multiprocessing. This article explores the coupling of such small- to medium-scale shared-memory multiprocessors through software over a local area network to synthesize larger shared-memory systems. We call these systems Distributed Shared-memory MultiProcessors (DSMPs). This article introduces the design of a shared-memory system that uses multiple granularities of sharing, ca ...

Keywords: distributed memory, symmetric multiprocessors, system of systems

12 The K2 parallel processor: architecture and hardware implementation
Marco Annaratone, Marco Fillo, Kiyoshi Nakabayashi, Marc Viredaz
May 1990 **ACM SIGARCH Computer Architecture News , Proceedings of the 17th annual international symposium on Computer Architecture**, Volume 18 Issue 3
Full text available: pdf(1.44 MB)   Additional Information: full citation, abstract, references, index terms

K2 is a distributed-memory parallel processor designed to support a multi-user, multi-tasking, time-sharing operating system and an automatically parallelizing FORTRAN compiler. This paper presents the architecture and the hardware implementation of K2, and focuses on the architectural features required by the operating system and the compiler. A prototype machine with 24 processors is currently being developed.

13 Exokernel: an operating system architecture for application-level resource management
D. R. Engler, M. F. Kaashoek, J. O'Toole
December 1995 **ACM SIGOPS Operating Systems Review , Proceedings of the fifteenth ACM symposium on Operating systems principles**, Volume 29 Issue 5
Full text available: pdf(2.16 MB)   Additional Information: full citation, references, citings, index terms

14 Using the SimOS machine simulator to study complex computer systems
Mendel Rosenblum, Edouard Bugnion, Scott Devine, Stephen A. Herrod
January 1997 **ACM Transactions on Modeling and Computer Simulation (TOMACS)**, Volume 7 Issue 1
Full text available: pdf(731.76 KB)   Additional Information: full citation, references, citings, index terms, review

Keywords: computer architecture, computer simulation, computer system performance analysis, operating systems

15 Improving the reliability of commodity operating systems
Michael M. Swift, Brian N. Bershad, Henry M. Levy
January 2005 **ACM Transactions on Computer Systems (TOCS)**, Volume 23 Issue 1
Full text available: pdf(459.98 KB)   Additional Information: full citation, abstract, references, index terms

Despite decades of research in extensible operating system technology, extensions such as device drivers remain a significant cause of system failures. In Windows XP, for example, drivers account for 85&percent; of recently reported failures.This article describes Nooks, a *reliability subsystem* that seeks to greatly enhance operating system (OS) reliability by isolating the OS from driver failures. The Nooks approach is practical: rather than guaranteeing complete fault tolerance through ...

Keywords: I/O, Recovery, device drivers, protection, virtual memory

16 An implementation and analysis of the virtual interface architecture
Philip Buonadonna, Andrew Geweke, David Culler
November 1998 **Proceedings of the 1998 ACM/IEEE conference on Supercomputing (CDROM)**
Full text available: html(60.53 KB)   Additional Information: full citation, abstract, references, citings

Rapid developments in networking technology and a rise in clustered computing have driven research studies in high performance communication architectures. In an effort to standardize the work in this area, industry leaders have developed the Virtual Interface Architecture (VIA) specification. This architecture seeks to provide an operating system-independent infrastructure for high-performance user-level networking in a generic environment. This paper evaluates the inherent costs and performanc ...

Keywords: cluster, interconnect, network, system-area, user-level, virtual interface architecture

17 Soft timers: efficient microsecond software timer support for network processing
Mohit Aron, Peter Druschel
December 1999 **ACM SIGOPS Operating Systems Review , Proceedings of the seventeenth ACM symposium on Operating systems principles**, Volume 33 Issue 5
Full text available: pdf(1.65 MB)   Additional Information: full citation, abstract, references, citings, index terms

This paper proposes and evaluates soft timers, a new operating system facility that allows the efficient scheduling of software events at a granularity down to tens of microseconds. Soft timers can be used to avoid interrupts and reduce context switches associated with network processing without sacrificing low communication delays.More specifically, soft timers enable transport protocols like TCP to efficiently perform rate-based clocking of packet transmissions. Experiments show that rate-base ...

18 Running on the bare metal with GeekOS
David Hovemeyer, Jeffrey K. Hollingsworth, Bobby Bhattacharjee
March 2004 **ACM SIGCSE Bulletin , Proceedings of the 35th SIGCSE technical symposium on Computer science education**, Volume 36 Issue 1
Full text available: pdf(103.18 KB)   Additional Information: full citation, abstract, references, index terms

Undergraduate operating systems courses are generally taught using one of two approaches: *abstract* or *concrete*. In the abstract approach, students learn the concepts underlying operating systems theory, and perhaps apply them using user-level threads in a host operating system. In the concrete approach, students apply concepts by working on a real operating system kernel. In the purest manifestation of the concrete approach, students implement operating system projects that run on ...

Keywords: education, emulation, hardware, operating systems

19 The design of RPM: an FPGA-based multiprocessor emulator
Koray Öner, Luiz A. Barroso, Sasan Iman, Jaeheon Jeong, Krishnan Ramamurthy, Michel Dubois
February 1995 **Proceedings of the 1995 ACM third international symposium on Field-programmable gate arrays**

Full text available: pdf(54.01 KB)   Additional Information: full citation, abstract, references, citings, index terms

Recent advances in Field-Programmable Gate Arrays (FPGA) and programmable interconnects have made it possible to build efficient hardware emulation engines. In addition, improvements in Computer-Aided Design (CAD) tools, mainly in synthesis tools, greatly simplify the design of large circuits. The RPM (Rapid Prototype Engine for Multiprocessors) Project leverages these two technological advances. Its goal is to develop a common hardware platform for th ...

Keywords: field-programmable gate arrays, logic emulation, message-passing multicomputers, rapid prototyping, shared-memory multiprocessors

20 On micro-kernel construction

J. Liedtke

December 1995 **ACM SIGOPS Operating Systems Review , Proceedings of the fifteenth ACM symposium on Operating systems principles**, Volume 29 Issue 5

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